I. GENERAL COURSE INFORMATION

Subject and Number: Physics 2A
Descriptive Title: General Physics
Course Disciplines: Physics/Astronomy
Division: Natural Sciences

Catalog Description:
This course is part of a one-year algebra- and trigonometry-based survey of physics. Topics covered include kinematics, statics, dynamics, momentum, energy, rotation, gravitation and planetary motion, fluids, kinetic theory of gases, and thermodynamics. In addition, the course covers elasticity and vibration, wave motion, interference, standing waves, and sound.

Conditions of Enrollment:
Prerequisite: Mathematics 170 with a minimum grade of C or equivalent

Course Length:	**X Full Term**	**Other (Specify number of weeks):**
Hours Lecture:	**3.00 hours per week**	**TBA**
Hours Laboratory:	**3.00 hours per week**	**TBA**
Course Units:	**4.00**	

Grading Method: **Letter**
Credit Status: **Associate Degree Credit**

Transfer CSU: **X Effective Date: Prior to July 1992**
Transfer UC: **X Effective Date: Prior to July 1992**

General Education:
El Camino College:
1 – Natural Sciences
Term: Other:

CSU GE:
B1 - Physical Science
Term: Other: Approved
B3 - Laboratory Sciences
Term: Other: Approved

IGETC:
5A - Physical Science with Lab
Term: Other:
5C - Science Laboratory
Term: Other:

II. OUTCOMES AND OBJECTIVES

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

1. **Applying Relevant Principles**: Students can identify the physical principles which are relevant in a given physical situation involving mechanics, heat, fluids or sound in order to correctly answer conceptual questions.

   Other exams

2. **Solving Physics Problems**: Students can identify and apply the relevant laws of physics along with the necessary mathematics to successfully solve a mechanics problem.

   Other exams

3. **Data Collection and Analysis**: Students can read and record, with appropriate units and uncertainties, measurements taken from a Vernier caliper and a micrometer caliper. Students can interpret and analyze that data, including error analysis.

   Laboratory Reports

B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Analyze physical problems in order to recognize the physical principles required to solve the problem, isolate and model the physical principles underlying each part of the problem, formulate the equations for each part, combine and solve the system of equations for the problem, and analyze and explain the results of the computations.

   Other exams

2. Conceptually explain physical phenomena perhaps too difficult for realistic mathematical modeling at the introductory physics level.

   Other exams

3. Demonstrate the ability to construct simple mechanical systems, make meaningful measurements using basic mechanical measuring devices, manipulate the collected data using basic error theories, report the outcome of the experiment, and explain the results physically.

   Laboratory reports

4. Demonstrate the ability to solve problems using Newton's Laws of Motion, momentum and impulse, work-energy theorem, conservation of energy, torque, the laws of thermodynamics, hydrostatics, hydrodynamics, Newton's Law of Universal Gravitation, and simple harmonic motion.

   Other exams

III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	27	I	MECHANICS A. Uniform motion in a straight line B. Average and instantaneous velocity C. Uniform accelerated motion D. Acceleration due to gravity E. Vectors F. Projectile motion G. Forces H. Newton's three laws of motion I. Equilibrium J. Center of gravity K. Friction L. Torque M. Momentum N. Collisions O. Work done by a constant force P. Potential and kinetic energy Q. Power R. Uniform circular motion S. Rotational inertia T. Conservation of angular momentum U. Conservation of energy V. Gravitational fields W. Dynamics of planetary motion
Lecture	6	II	SOLIDS AND FLUIDS A. States of matter B. Elastic properties C. Density D. Pressure E. Buoyancy F. Fluids in motion G. Bernoulli's equation
Lecture	12	III	THERMODYNAMICS A. Temperature B. Temperature scales C. Thermal expansion D. Internal energy E. Heat and work F. The first law of thermodynamics G. The second law of thermodynamics H. Specific heat capacity I. Ideal gas law J. Latent heats K. Heat transfer by conduction

			L. Convection and radiation
Lecture	9	IV	WAVE MOTION AND SOUND A. Hooke's law B. Simple harmonic motion C. Pendulum motion D. Waves and disturbances E. Sound F. Longitudinal and transverse waves G. Periodic waves H. Superposition I. Beats J. Doppler effect K. Interference L. Resonance phenomena M. Vibrating strings N. Vibrating air columns
Lab	54	V	LABORATORY WORK (Lab activities analyzed involve real-world data collection.) Choose from the following. Those marked with an asterisk (*) are mandatory. A. Measurements (*) B. Graphs of Velocity, Acceleration, and Displacement vs. time (*) C. Newton's Second Law (*) D. Vector Quantities and the Force Table (*) E. Simple Machines F. Ballistic Pendulum (*) G. Center of Gravity and Rotational Equilibrium (*) H. Uniform Circular Motion I. Simple Harmonic Motion and Hooke's Law J. Acceleration Due to Gravity and Terminal Velocity K. Kinetic Friction L. Density and Archimedes' Principle (*) M. Coefficient of Linear Expansion N. Specific Heat O. Heat of Fusion, Vaporization, and Sublimation P. Standing Waves in Strings (*) Q. Velocity of Sound in Air by Resonance
Total Lecture Hours		54	
Total Laboratory Hours		54	
Total Hours		108	

IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

A. **PRIMARY METHOD OF EVALUATION:**

Problem solving demonstrations (computational or non-computational)

B. **TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:**

A 3-kg mass and a 5-kg mass are connected by a light string that passes over a frictionless pulley. Determine

a) the tension in the string, and
b) the acceleration of the masses.

Show your calculations in the space provided.

C. **COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:**

1. A 25-kg child swings on a 2.0 m long swing. The swing is released with an initial speed of 2.00 m/s when the swing supports make an angle of 30 degrees with the vertical. Neglecting frictional losses, what is the speed of the child when she is directly beneath the support point for the swing? Show your calculations in the space provided.
2. A projectile is shot from the edge of a cliff 100 m above ground level with an initial speed of 45 m/s at an angle of 40 degrees above the horizontal.
   a) How much time elapses before the projectile hits the ground?
   b) How far from the base of the cliff does the projectile land?
   c) What are the horizontal and vertical components of the projectile's velocity vector just before it lands?
   Show your calculations in the space provided.

D. **OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:**

Objective Exams
Other exams
Quizzes
Written homework
Laboratory reports
Homework Problems
Multiple Choice

V. INSTRUCTIONAL METHODS

Demonstration
Laboratory
Lecture

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

VI. WORK OUTSIDE OF CLASS

Study
Answer questions
Required reading
Problem solving activities

Estimated Independent Study Hours per Week: 6

VII. TEXTS AND MATERIALS

A. UP-TO-DATE REPRESENTATIVE TEXTBOOKS

Serway and Vuille. College Physics. 11th ed. Cengage, 2018.
Physics Faculty. Physics 2A/3A Lab Manual. El Camino College, 2007 (Discipline Standard)

B. ALTERNATIVE TEXTBOOKS

C. REQUIRED SUPPLEMENTARY READINGS

D. OTHER REQUIRED MATERIALS

scientific calculator
protractor
ruler

VIII. CONDITIONS OF ENROLLMENT

A. Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification
Course Prerequisite Mathematics-170 or	Computational/Communication Skills
Non-Course Prerequisite	This course makes extensive use of trigonometry. Students who have not taken Math 170 will need to have equivalent knowledge of trigonometry in order to do many of the calculations required for this course.

B. Requisite Skills

Requisite Skills
Define and evaluate trigonometric functions involving sine, cosine and tangent. MATH 170 - Define trigonometric functions using the unit circle and right triangles. MATH 170 - Evaluate trigonometric functions and inverses, both with and without technology.
Analyze triangles using the sine, cosine and tangent functions, and the Pythagorean Theorem. MATH 170 - Solve problems using angles and right triangles. MATH 170 - State the laws of sines and cosines and solve problems involving non-right triangles.

C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification

D. Recommended Skills

Recommended Skills

E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact

Course created by Physics Department on 02/01/1965.

BOARD APPROVAL DATE:

LAST BOARD APPROVAL DATE: 01/22/2019

Last Reviewed and/or Revised by: Susan Stolovy **Date:** Sept. 29, 2018